2001 Trial Transcripts Part 2

noise [20] solving plan, they were conducting tests on this [21] Honeywell APU; is that correct?

[22] **A:** No.

[23] **Q:** Why is that not a correct statement?

[24] **A:** Turbomeca designed and developed the load

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[1] compressor for that APU. It was Turbomeca's [2] engineering, Turbomeca's expertise, Turbomeca's [3] development costs. They used the GTCP-331-350 as [4] a scriptor for the piece of equipment that they [5] had designed and supplied to Allied Signal.

[6] So when they are testing something, [7] they are testing their own design, their own [8] technology.

[9] They happened to supply that to [10] Honeywell, then Allied Signal, so this is just a [11] name, a scriptor.

[12] **Q:** So it's your understanding that the [13] reference to GTCP-331-350 load compressor module [14] has nothing to do with Honeywell's APU?

[15] **A:** No, that's not what I said. That's [16] esting Turbomeca's load compressor nodule which [17] they signed designed ınd developed at their own [18] expense ınd sold to Allied Signal, but it says [19] oad compressor module, that in definition says [20] what it was — that in lefinition says that it was [21] not an APU, hat it was running because it was [22] just he load compressor module, which hey sold [23] to Allied Signal.

24] So it was their own equipment, their

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1] design, their technology.

2] **MR. ZIEGLER:** Your Honor, I [3] apolgize for interrupting, but might counsel ome [4] to side-bar to discuss one issue?

5] (Beginning of side-bar conference.)

6] **MR. ZIEGLER:** A portion that [7] Mr. chulman was just reading is part of our 8] counter-designations on top of page 01. It's [9] very important to us — nfortunately it didn't [10] show up in /hat was being shown to jury on the [11] oard.

2] **THE COURT:** It was read, but it [13] /asn't displayed?

4] **MR. ZIEGLER:** And I don't know how 5] to cure that problem. But it's a real roblem, [16] this is really important to us.

7] **MR. KRUPKA:** It's not intentional, [18] our Honor.

9] **THE COURT:** We'll need to go back.

0] **MR. KRUPKA:** And what we can do is 1] we can put one of the copies of the eposition on [22] the Elmo if that's hat's important.

[23] **THE COURT:** Will that cure the [24] problem? We are just going have to go back.

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[1] **MR. ZIEGLER:** Thank you, Your Honor.

[2] (Conclusion of side-bar conference.)

[3] **THE COURT:** Members of the Jury, a [4] portion of the counter designations, the [5] deposition testimony that Hamilton Sundstrand [6] wanted you to hear was not seen as well, so we're [7] going to arrange to go back right now and place [8] those portions on the thing that's been referred [9] to as the Elmo, so that you can visualize as well [10] those counter designations.

[11] **THE COURT:** Do you want my copy?

[12] **MR. KRUPKA:** I apologize, Your [13] Honor, but that might be — or actually maybe I [14] could borrow — I think we handed up several.

[15] **THE COURT:** Yes.

[16] **MR. KRUPKA:** And we'll all be able [17] to look at it at the same time. Thank you.

[18] **THE COURT:** Members of the jury, are [19] you able to see the screen? The jury has [20] indicated they can see the screen.

[21] **MR. KRUPKA:** Mr. Schulman, if you [22] could pick it up or actually Ms. Reznik, if you [23] could pick it up at Page 500, Line 17, please.

[24] **BY MR. ZIEGLER:**

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[1] **Q:** So as part of Turbomeca delta P/P noise [2] solving plan, they were conducting tests on this [3] Honeywell APU; is that correct?

[4] **A:** No.

[5] **Q:** Why is that not a correct statement?

[6] **A:** Turbomeca designed and developed the load [7] compressor for that APU. It was Turbomeca's [8] engineering, Turbomeca's expertise, Turbomeca's [9] development cost. They used — the GTCP-331-350 [10] was a scriptor for the piece of equipment that [11] they had designed and supplied to Allied Signal.

[12] So when they are testing something, [13] they are testing their own design, their own [14] technology. They happen to supply that to [15] Honeywell, then Allied Signal.

[16] And so this is just a name — a [17] scriptor.

[18] **Q:** So it's your understanding that the [19] reference to GTCP-331-350 load compressor module [20] has nothing to do with Honeywell's APU?

[21] **A:** No. That's not what I said. This is [22] testing Turbomeca's load compressor module, which [23] they designed and developed at their own expense [24] and sold to Allied Signal.

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[1] But it says load compressor module. [2] That, in definition, says that it was not an APU, [3] that it was running because it was just the load [4] compressor module, which they sold to Allied [5] Signal.

[6] So it was their own equipment, their [7] design, their technology.

[8] **MR. KRUPKA:** I think we can now go [9] back to the computer reading, Your Honor.

[10] **THE COURT:** Great.

[11] **MR. KRUPKA:** I apologize for that.

[12] **Q:** So is it Sundstrand's belief that the [13] testing referenced here for the 331-350 load [14] compressor module was information Turbomeca had [15] the right to share with Sundstrand?

[16] **A:** Yes.

[17] **Q:** Is this data provided by Mr. Macarez an [18] example of the type of data that was often [19] provided to Sundstrand by Turbomeca?

[20] **A:** No.

[21] **Q:** Why is that not a fair statement?

[22] **A:** You said typically. I can't think of any [23] other instance with data of this nature, so this [24] is an isolated case.

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[1] **Q:** Earlier we looked at Plaintiffs' Exhibit [2] 61, an example of references by Turbomeca to the [3] GTCP350 load compressor module; correct?

[4] **A:** That's just the name that Turbomeca gave [5] a piece of equipment which they had designed, [6] yes. It's just a name.

[7] **Q:** So information Turbomeca had acquired in [8] their development of that 350 load compressor [9] module was often supplied to Sundstrand; correct?

[10] **A:** No.

[11] **Q:** Was such information ever supplied to [12] Sundstrand by Turbomeca?

[13] **A:** What do you mean by "such information"?

[14] **Q:** Information relating to Turbomeca's [15] development of that 350 load compressor?

[16] **A:** On this one occasion, one instance, [17] Turbomeca supplied data concerning the load [18] compressor which they had designed. They were the [19] design authority for it.

[20] They chose to call it the [21] information. They gave it a reference for any APU [22] that it would be designed for.

[23] Q: This memo goes on to describe testing by [24] Turbomeca of sensors; correct?

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[1] A: No.

[2] Q: What does it describe?

[3] A: It's exactly the same information we just [4] described, the date, this is one day off from when [5] the coordination memo was sent. And this is [6] testing of the Turbomeca designed load compressors [7] which would be named GTCP-330 through 350.

[8] Q: Would it be fair to say that Turbomeca in [9] the process of providing information regarding [10] delta P/P measurements to Sundstrand would refer [11] to its development in testing of load compressor [12] modules that it intended to use in its contract [13] with Honeywell?

[14] A: Yes.

[15] (Conclusion of read-in portion of [16] Peter Suttie's deposition.)

[17] MR. KRUPKA: Your Honor, if I may [18] introduce the next excerpt.

[19] The one thing I forgot to mention [20] earlier is that these excerpts of the depositions [21] include portions that Honeywell, the plaintiffs [22] select, as well as portions that Hamilton [23] Sundstrand selects for context.

[24] And that was what the error was, and

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[1] we apologize.

[2] The next deposition is of [3] Mr. John Szillat. It's from two episodes of his [4] deposition, June 15th, 2,000, and January 19th, [5] 2,001.

[6] He is a Sundstrand systems [7] engineer. He worked on the APS 3200 control [8] system. That's the one that's accused of [9] infringement.

[10] He will explain the relationship [11] between Sundstrand and Turbomeca on that project [12] and also testify to the fact that no effort was [13] made by Sundstrand to check to see if it was [14] infringing Honeywell's patents.

[15] (Beginning of read-in portion of [16] John Szillat's deposition.)

[17] Q: Would you please state your full name for [18] the record?

[19] A: John Carl Szillat.

[20] Q: So did you start with Sundstrand in [21] August of '97?

[22] A: That's right.

[23] Q: And have you been working with Sundstrand [24] continuously since then?

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[1] A: Yes, I have.

[2] Q: What were your titles and [3] responsibilities when you first went to work for [4] Sundstrand?

[5] A: I started, and I still am a systems [6] engineer.

[7] Q: What does that involve?

[8] A: That involves running engine tests and [9] defining requirements for the engine control, [10] primarily the control software.

[11] Q: Are there particular engines that you [12] have worked with since you have been with [13] Sundstrand?

[14] A: I've worked on the APS 2000 and the APS [15] 3200. That's all.

[16] Q: Prior to the filing of this lawsuit, were [17] you aware of any Honeywell patents for surge [18] control?

[19] A: No, I was not.

[20] Q: Did you ever, in doing your work on [21] Sundstrand's APUs, have you ever considered [22] whether any of the technology in those APUs [23] infringed any patents?

[24] A: No, I had not thought of that.

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[1] Q: Have you or anyone else that you are [2] aware of at Sundstrand ever investigated whether [3] any patents related to any technology implemented [4] any of Sundstrand's APUs?

[5] A: I'm not aware of any such thing.

[6] Q: You're not aware of anyone doing any such [7] investigation?

[8] A: No, I'm not.

[9] Q: In doing your development work for [10] Sundstrand, have you ever considered whether any [11] of the technology you considered implementing may [12] infringe any existing patents?

[13] A: No. I have not thought of that.

[14] Q: Is there a reason you haven't done that?

[15] A: I would say primarily because the work [16] that I have done at Sundstrand has been primarily [17] to change values in the software, and not change [18] the structure of the software. And the numbers [19] are all based on engine test data, so it's not [20] based on any analytical or simulated analysis.

[21] Q: Do you have any patents?

[22] A: Yes, I do.

[23] Q: For what kind of technology?

[24] A: For fuel control.

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[1] Q: How many patents do you have?

[2] A: Four patents.

[3] Q: Are they all related to fuel control?

[4] A: Three of them are related to fuel [5] control.

[6] Q: And what's the fourth?

[7] A: The fourth one is related to surge and [8] engine blow out protection.

[9] Q: Who owns patents?

[10] A: Pratt & Whitney.

[11] Q: As the inventor on patents, it never [12] occurred to you to look at whether or not any of [13] Sundstrand's APU technology used any patented [14] technology?

[15] A: No, it did not.

[16] Q: Who is Turbomeca?

[17] A: Turbomeca is a French aerospace company [18] that worked in partnership with Sundstrand under [19] the name APIC for a number of years.

[20] Q: Could you describe the nature of that [21] partnership?

[22] A: I don't know all of the precise details [23] of the partnership. That taken, I would say that [24] Turbomeca and Sundstrand had divided up many of

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[1] the engineering functions and testing of APU [2] components.

[3] Q: Is it your understanding that Turbomeca [4] had responsibility for the surge control system in [5] the APS 3200?

[6] A: It is my impression that they were the [7] group primarily responsible for analyzing load [8] compressor behavior, and suggesting bleed control [9] valve software design.

[10] (Conclusion of read-in portion of [11] John Szillat's deposition.)

[12] MR. KRUPKA: Your Honor, that [13] completes the deposition designations for this [14] morning.

[15] THE COURT: Mr. Herrington, do you [16] need —

[17] MR. ZIEGLER: Can this be done with [18] the Court's permission? It's a little [19] extraordinary.

[20] THE COURT: What is it we're trying [21] to accomplish?

[22] MR. ZIEGLER: There is apparently an [23] omitted counter designation.

[24] THE COURT: Okay.

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[1] MR. KRUPKA: Is it just the next [2] question and answer? If Mr. Schulman can get back [3] up on the stand, we can just read the next [4] question and answer.

[5] We don't have it, but we're happy to [6] read it.

[7] MR. HERRINGTON: It's something [8] that was lost, maybe we can do it at the break.

[9] MR. KRUPKA: Very well, Your Honor.

[10] THE COURT: All right. Are we [11]

vents the [16] air coming in, going back, going in, coming back, [17] it would be huffing and puffing. And that's what [18] you would actually see physically if you had a [19] malfunctioning surge control system.

[20] But, fortunately, surge control [21] systems work well and you rarely have this [22] occurrence in planes.

[23] **Q:** Let me ask Mr. Schlaifer to run it again, [24] because it was pretty quick. Let me have it run

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[1] again.

[2] **A:** Can we stop it at various times?

[3] **Q:** All right.

[4] **A:** If you just stop it here, basically, it's [5] showing again, just to recap, you have the air [6] coming in the top there just as we had on the [7] model, going through the IGV, going around the air [8] compressor, up into this collector.

[9] It then rises up into the bleed [10] control valve, which allows the separation of the [11] air between going to the cabin and going to the [12] exhaust. And it does this, it does this normally [13] to prevent this condition called surge.

[14] That is, it makes sure that the flow [15] of the compressor is always above a certain point [16] where this condition of surge can actually occur. [17] So that's what that valve is doing.

[18] So, normally, you don't experience [19] or hear any surge, and the compressor doesn't [20] experience any surge as long as this valve is [21] working well.

[22] Now if we could continue. But if [23] there is a malfunction and now you have all the [24] air going to the cabin and that air, — but the

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[1] cabin is asking for a very small amount [2] of air and your surge control system has failed, then you [3] will have this surge condition where the flow will [4] run back and forth.

[5] And that's the significance of those [6] arrows shown going up and going down. [7] signifies the air going back and forth, back and [8] forth.

[9] **Q:** Let me, once the video plays through, ask [10] you if you are familiar with the two Honeywell [11] patents that are at issue in this case?

[12] **A:** Yes, I am.

[13] **MR. PUTNAM:** With the Court's [14] permission, may I approach?

[15] **THE COURT:** Yes.

[16] **BY MR. PUTNAM:**

[17] **Q:** Let me hand you what have previously been [18] marked as Plaintiffs' Exhibits 1 and 2, and I'll [19] note that these are both in the Honeywell jury [20] notebook.

[21] **MR. PUTNAM:** Your Honor, you'll [22] probably end up with a number of these.

[23] **THE CLERK:** They are in the book.

[24] **MR. PUTNAM:** They are in the book.

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[1] **BY MR. PUTNAM:**

[2] **Q:** I think they should be at the very [3] beginning of the Honeywell jury notebook.

[4] And let me just ask Mr. Schlaifer to [5] put up the first page of Honeywell Exhibit 1, I [6] suppose, just so we have something on the screen.

[7] Mr. Muller, are you familiar with [8] the Honeywell patents?

[9] **A:** Yes, I am.

[10] **Q:** We'll get into the specifics of the [11] claims a little bit later in your testimony. For [12] now, can you just tell the jury, as a general [13] matter, what these patents relate to?

[14] **A:** What they relate to is a unique design [15] for a surge control system that allows the APU, a [16] gas turbine driven APU to run — to perform the [17] function of surge control and do it in an [18] efficient and reliable manner.

[19] **Q:** Okay. Now, both when you were looking at [20] the APU and when we were looking at the video, [21] there was something on the video depicted as the [22] bleed control valve, which I think you had was the [23] same as the surge control valve.

[24] And then you pointed out something

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[1] here called the surge control valve.

[2] **A:** By the way, just allow me to correct [3] that, functionally, it's the same as — the surge [4] control valve and the bleed control valve [5] functionally are the same.

[6] **Q:** Thank you.

[7] What is a surge control system?

[8] **A:** A surge control system, now what we've [9] shown here is you see a mechanical valve. Well [10] something has to control it.

[11] And what it has to do is as I [12] mentioned, is that to control surge, you have to [13] have — you are sensitive — well, I should say [14] surge occurs at a certain flow. And so you need a [15] means to be able to identify that flow in some [16] way.

[17] That information then — once you [18] obtain that information, you then put it into an [19] electronic control, a small little computer, which [20] with that information and other guidelines that [21] have been put into it, based on performance tests, [22] it sends out instructions, which eventually get [23] turned into a pressure of some kind to operate a [24] valve, to open or close a valve, or modulate a

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[1] valve in order to control the surge control [2] system.

[3] And that entire thing, the [4] measurement, the measurement of the flow or [5] pressure, the measurement of temperature as well [6] is part of it, the actual computer and the [7] programs and software that's involved, and the [8] actual command, which eventually get to the valve [9] to make it modulate, one way or the other, is what [10] we call generally the surge control system.

[11] **Q:** Before the Honeywell patents, how did [12] these type of APUs, these high speed APUs control [13] the surge valve?

[14] **A:** The surge control valve in prior [15] installations, one of the ways, there was a range [16] of ways, there were various models operating with [17] different speeds and different sizes. One of the [18] ways that was used was to open up a valve, that is [19] when the flow got too low and the compressor says, [20] "I need more flow because I'm going to go in [21] surge", but the aircraft in this case says, "But [22] look, I only need so much."

[23] And so you had to do something — [24] you had to make sure that the compressor was happy

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[1] and that the aircraft was satisfied. The aircraft [2] is saying, "I need less". The compressor is [3] saying, "But I can't go that low."

[4] So what was done is in the discharge [5] portion, a separate, a separate pipe was put in [6] with a valve on it that would open up and allow [7] air to go through it to maintain a minimum flow [8] going through the compressor.

[9] But what it would do is, it would [10] open up at a minimum flow and then it would [11] increase flow in order to get it away from the [12] surge point. And that was generally how it was [13] done because the concern always was, and I didn't [14] mention this, that when surge occurs, and we [15] haven't touched on what happens to compressor when [16] surge occurs, and I think it's important to [17] mention that.

[18] **Q:** Okay. Let me just ask the question, [19] then. What happens when surge occurs in a [20] compressor?

[21] **A:** Thank you.

[22] We talked about surge up to now in [23] terms of, gee, it's not good and you get things, [24] and you feel the surge goes

back and forth.

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[1] Well, really the question is: So [2] what? So it can be in there and it doesn't sound [3] good, what harm does it do? And that's the [4] issue.

[5] Surge is the most destructive [6] operational thing that can happen to a centrifugal [7] compressor or any compressor of this basic [8] design. And the reason is this: You recall I [9] mentioned that the compressor, when it compresses [10] air, that air is coming out at between four and [11] 500 degrees Fahrenheit.

[12] That's pretty hot. [13] And the reason it stays at that [14] temperature as well is because cool air is coming [15] in the front, it's going through it and it [16] continues to take — to push all that hot air [17] out.

[18] Now, consider for a moment that [19] while this gas turbine is running away at [20] 50,000 RPM, let's say, and it's putting power into [21] the compressor, but suddenly that air, which was [22] also taking away this hot air that you had [23] compressed and produced, suddenly it starts coming [24] back in.

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[1] So this hot air starts coming back [2] in while you're producing more hot air. And [3] suddenly the compressor is getting hotter and [4] hotter and hotter. And being metal, and being [5] very like metal, something which is aluminum, for [6] instance, as you may know, expand very easily, [7] when that hot air comes in, it gets so hot on the [8] outside of the compressor, the paint, I've seen [9] this myself, the paint will begin to burn off.

[10] Inside the metal will begin to [11] expand. Since these are very tight clearances in [12] there, they will begin to contact things. And [13] keep in mind that it's spinning away at 50,000 [14] RPM.

[15] So when it makes contact with [16] something, it then begins to destroy itself and it [17] can easily catastrophically fail. And this does [18] occur.

[19] So surge is not simply an [20] inconvenience in terms of flow going back and [21] forth, but if allowed to continue and if severe [22] enough it can literally destroy the entire [23] compressor and consequences are left to your [24] imagination as to what is left in the aircraft.

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[1] **THE COURT:** I think this would be a [2] good time to take our morning break.

[3] **MR. PUTNAM:** Thank you, Your Honor.

[4] (A brief recess was taken.)

[5] **THE COURT:** Welcome back, members. [6] We're going to get going again.

[7] **THE COURT:** Welcome back, members [8] of the jury. We're going to get going again.

[9] Mr. Putnam.

[10] **MR. PUTNAM:** Thank you, Your [11] Honor.

[12] **BY MR. PUTNAM:**

[13] **Q:** I think when we broke I had just asked [14] you about how previous surge control systems [15] worked and you described in general terms. Let me [16] ask you this: Did those systems work well for [17] their purpose?

[18] **A:** The surge control systems on centrifugal [19] compressors have existed for a long time, because [20] surge has always been a problem with compressor [21] operation.

[22] So there were surge control concepts [23] and systems that have been available for many, [24] many years and had worked adequately for their

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[1] services in other applications.

[2] **Q:** How about when it came to applying those [3] concepts to a compressor like found on APUs like [4] you were showing the jury earlier this morning?

[5] **A:** Well, on the APU, you have to understand, [6] you know, I'm trying to convey to you as a [7] designer, because I spent much of my life both [8] designing and evaluating the designs.

[9] Generally, what you do when you go [10] about designing a new piece of equipment is you [11] base it on an old piece of equipment because you [12] are forced to — you are forced to build a piece [13] of equipment in a time constraint, so much money, [14] so much manpower and you have certain objectives.

[15] So what you do is you go about, for [16] instance, if you have that testimony you want to [17] make a larger one. Well, you would scale things [18] up, basically, and then you would see how it would [19] work.

[20] And you will apply everything that's [21] worked before, and put it on, and see how it [22] works. The same was true of surge control systems [23] as well.

[24] They took surge control systems that

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[1] had worked adequately in the past and tried — and [2] put them on these designs and tried — and then [3] tested them to see how they would work.

[4] Well, what they found was they [5] didn't work well. Apparently, because of [6] sensitivity of these designs, these, again, are [7] very high speed specialized designs, and the [8] application, the fact that you have these varying [9] demands, air demands coming from the aircraft [10] which was a special problem, which for instance, [11] is not true on the same basic design used on the [12] gas turbine, with a steady flow.

[13] When they tried to use the old surge [14] compressor systems, they found they did not work [15] properly, they cannot work efficiently. And [16] remember these APUs, something I didn't mention [17] before, is when they start up, they are draining [18] their fuel from the main fuel tanks, the same ones [19] used for the engines, and once that plane is at [20] the gate, they put fuel into it.

[21] It gets filled up before it gets to [22] the gate. It gets to the gate, and that's when [23] they start the APU. And as you know, they can sit [24] there for a while, and they may go out there and

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[1] taxi for a while, they may have to sit for a while [2] before they actually take off, so fuel efficiency [3] is very important on these APUs.

[4] And the surge control systems that [5] they had in the past, because of their [6] characteristics, did not provide the kind of [7] efficiency, and also did not satisfy the overall [8] operability of the — or the operability that was [9] desired, that was associated with this very flow [10] demand that they had from the aircraft.

[11] So what the designers were forced to [12] do, and from my experience it has always been the [13] case that, basically, that when you innovate, when [14] you invent something, it comes out not because you [15] want to invent something, it's because you have to [16] invent something.

[17] It's out of necessity. [18] You try to make the old thing work. [19] You couldn't make it work, so now you've got to [20] figure out a new way of doing it, because actually [21] you look for every other way that's been done, how [22] does this work, how does that work, can't find [23] it. I've finally got to bite the bullet and say [24] we have to come up with something better that

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[1] doesn't exist.

[2] So what they did was they went out [3] and they had to design something that satisfied [4] the unique characteristics that APUs, gas turbine [5] driven load compressors are faced when supplied on [6] aircrafts, a very special, very special problem.

[7] And so they designed this surge [8] control system, and then like you do, usually with [9] basic innovations, when you have something new, [10] you want to find out if it's patentable. That's [11] how patents come about in this field when you [12] innovate as a necessity to make a

[23] THE COURT: Mr. Krupka.

[24] MR. KRUPKA: Your Honor, the only

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[1] thing I would add is he's not being offered to his [2] opinions with respect to any new issue. There is [3] no new opinions and simply these don't relate to [4] the surge control system and quite frankly I don't [5] think Mr. Herrington would disagree. And if he [6] does, he can cross-examine him on it.

[7] THE COURT: I tend to agree on [8] that. I think what the objection is and [9] Mr. Herrington can correct me if I'm misstating [10] his position, is he's now testifying as a fact [11] witness essentially. Is that basically it?

[12] MR. HERRINGTON: That's right.

[13] THE COURT: And's he testifying [14] beyond the scope of his expert report. I do take [15] your point and I do believe that he can be [16] cross-examined. Go ahead, Mr. Ziegler.

[17] MR. ZIEGLER: He's frankly not a [18] fact witness who knows this information, whatever [19] he relates as a fact witness would be hearsay to [20] him. He's not an expert in APU, he's a man who is [21] expert in —

[22] THE COURT: You're saying that —

[23] MR. ZIEGLER: He's not competent.

[24] THE COURT: In commenting on the FAA

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[1] notice, you're suggesting — you're arguing that [2] he has gone beyond the scope of his expertise?

[3] MR. ZIEGLER: I think it's two [4] points. If it's within his expertise, then it's [5] opinion testimony of which there was no notice. [6] Perhaps they could put it on in their rebuttal [7] case, in their case in chief. To the extent it's [8] not opinion testimony, then it's fact testimony [9] for which I believe that it's pure hearsay. He's [10] repeating what some Honeywell engineers told him.

[11] MR. HERRINGTON: He testified in his [12] deposition that he never has worked on APUs.

[13] MR. KRUPKA: Your Honor, the only [14] other point I would make with respect to the [15] testimony that came in on the airworthiness, there [16] was a lot of questions and answers that went back [17] and forth and they didn't object.

[18] THE COURT: I'm not going to strike [19] that testimony, but I will prevent you from [20] proceeding any further down the road with the [21] witness. You do have recourse on rebuttal. I [22] will not grant the motion to strike.

[23] (Conclusion of side-bar conference.)

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[1] BY MR. PUTNAM:

[2] Q: Mr. Muller, are you familiar with the APS [3] 3200, the APU manufactured by Sundstrand that's at [4] issue in the case?

[5] A: Yes, I am.

[6] Q: And does the APS 3200 have a system or [7] method for controlling surge?

[8] A: Yes, it does.

[9] Q: And are you familiar with that surge [10] control system.

[11] A: Yes, I am.

[12] Q: I'm going to ask you in a second to [13] explain that to the jury, but first of all, can [14] you tell us generally how it is that you became [15] familiar with the surge control system used on the [16] APS 3200?

[17] A: I became familiar with it after I became [18] involved with this case.

[19] Q: And what did you do as part of your work [20] on this case to gain your understanding of the way [21] that the surge control system on the APS 3200 [22] works?

[23] A: Well, I was provided, by your office, [24] with the information that was provided to you by

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[1] Sundstrand regarding their descriptions of the APS [2] 3200 or, in other words, my understanding of the [3] APS 3200 is completely based on the information [4] provided by Sundstrand.

[5] Q: Let me ask you to briefly identify two [6] documents in that regard. Let me first show you [7] what's been marked as Honeywell PTX Exhibit Number [8] 63.

[9] This is a thick document. There are [10] pages of this in the jury notebook, but not, I [11] think, the entire document.

[12] And Mr. Muller, the only question [13] for right now is can you look at this, [14] refamiliarize yourself with this enough to — [15] first of all, tell me if you've seen this as part [16] of your work on the case.

[17] A: Yes, I have.

[18] Q: What is this?

[19] A: This is what is termed the ECB [20] requirements specification, meaning electronic [21] control box, ECB.

[22] Q: And for what APU or what machine does it [23] relate to?

[24] A: It indicates that it was intended for the

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[1] APS 3200.

[2] Q: And does that contain a description of [3] the surge control system used in the APS 3200?

[4] A: Yes, it does.

[5] Q: Let me next hand you another document, [6] which is Honeywell PTX 910, and ask if that is a [7] document that you saw and reviewed as part of your work on this matter?

[9] A: Yes, it is.

[10] Q: And can you tell the jury what Honeywell [11] PTX 910 is, please?

[12] A: Well, this is one of the many engineering [13] specifications that, of hundreds of specifications [14] that are used. And this is something called a [15] system requirement specification, which goes into [16] the — a short description and — a short [17] description of various functions and defines [18] locations where things are measured, things of [19] that nature.

[20] I'm not sure where it fits into [21] Sundstrand's scheme of how they develop things, [22] but this is a fairly typical document that is [23] provided as part of the development of any [24] engineering system.

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[1] Q: And what system or machine does that [2] specification relate to?

[3] A: It appears to relate to the surge control [4] system.

[5] Q: And does it relate to the APS 3200, sir?

[6] A: Yes, it does.

[7] Q: And have you also read the deposition [8] testimony, the sworn testimony that's been [9] provided by some of these Sundstrand, Hamilton [10] Sundstrand engineers in this case?

[11] A: Yes, I have.

[12] Q: And have you also considered that [13] testimony as part of reaching the opinions that [14] you have reached in this case?

[15] A: Yes, I have.

[16] Q: All right. Have you prepared, or [17] assisted in the preparation of schematics of the [18] APS 3200 surge control system in order to explain [19] that system to the jury?

[20] A: Yes, I have.

[21] MR. PUTNAM: All right. With Your [22] Honor's permission, I would like to ask the [23] witness to step down and show the schematics, what [24] we have done, because as I mentioned to Your Honor

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[1] earlier, I wanted to use the screen. And I have a [2] binder, which has the schematics that are going to [3] be use

[4] The first ones are the ones that are going to be projected on the screen and the later [6] four are the ones that will be used here. And I [7] provided a copy to counsel.

BY MR. PUTNAM:

Q: Mr. Muller, take it away. Start wherever you want to, and I want you …plain how it is that the APS 3200 … control system works?

A: Okay. Let's first get ourselves oriented as to what the job is that's at hand.

Q: First of all, can you tell the jury what it is that you're looking at there?

A: Yes, what we're looking at is an outline of a cross-section, a slice right through the engine. It's a cross section showing all the elements that we discussed.

This is of the APS 3200, which while very similar, and in fact, the load compressor is very hard to distinguish to the layperson as to what the differences would be, they're very subtle between the Sundstrand load compressor and the

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Honeywell load compressor.

Q: Let me ask you, and for the record, I think you're looking at Honeywell PTX 952; is that correct?

A: That's right.

Q: What was the schematic prepared from?

…t was prepared from a drawing … Sundstrand, and I'm not sure in which document, but it's one of their drawings and what we basically did was just make an outline for it for the purpose of illustrating the major points that are at issue in this case.

Q: Using that diagram or schematic, can you start explaining to the jury how the Sundstrand APS 3200 surge control system works?

A: Well, what — the way it basically works is that, again, in the Sundstrand machine, the inlet guide vanes determine the amount of flow going to compress, and based on the demand from the aircraft, and that is a typical function.

It is, basically, the compressor that we have here is similar in appearance to what we have there. It collects it in much the same way.

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You can see the shapes are very similar. And then it discharges, it discharges through a duct and then it gets to a device that Sundstrand calls the bleed control valve, which performs t… …ilar function to the surge control … system used by Honeywell as well.

And what it does is based on — based on a series of measurements such as temperature and pressure, and position of the IGV, it determines — and the load demand from the aircraft, it determines, it has a valve in here which in much the same way diverts an amount of air going to the aircraft or going to the exhaust such that this amount of air — I should say such that at all times, this amount of air plus this amount of air always equals the amount that's coming out of this — coming out of the compressor.

So that this — as the amount of air goes here or here, and as the valve changes position, so that this can increase or decrease, the actual flow coming out of the compressor stays constant.

So what you're really doing is you

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got flow going out, you're kind of diverting it and channeling it one way or the other, but you're not changing the amount of flow coming in here. That's how it performs its basic surge control function.

That is, when a signal comes from the surge control system that says, We're getting a low flow, just as it did here, what it does here is it will divert the flow to the exhaust to maintain a constant minimum flow so the compressor never gets low enough to get close to this surge point. And that's basically how it works.

Q: I'm sorry. You may need to step back.

We're looking for a pointer which might be an arm extender, or a pencil works perfectly. I want to make sure that all the jurors on the side can see.

You talked a couple of times about the logic that the bleed control valve uses. Do you have some diagrams to help show the jury the logic that the 3200 bleed control valve uses?

A: Yes,. Let me start off with a more general diagram.

By the way, everything that I'm

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showing you was obtained — this was a characterization that we just made an outline for this purpose. But what I'm showing you now are actual, and I think you have this in your jury book, I have not seen your jury book, so I assume it's in there, but these are the actual schematics and figures that are there. And we've just blown them up here.

Q: Mr. Muller, let me give you something longer than a pencil. For the record, you're looking at Honeywell PTX 953.

And I want to make sure the jury is clear on what we're looking at. I see that there are some colors on the PTX 953, and there is a little legend on the color coding.

I want to be clear, is that from the Sundstrand document or is that something that's been added?

A: No, this was not in the Sundstrand documents, this was added by me for illustrative purposes.

Q: When you say "this", you're talking about the color?

A: Yes, the color is just to highlight these

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things, so it's easier to follow.

Q: How about the text from this part of the diagram down, was that text that you added or was that text from the Sundstrand document?

A: As far as I recall, this is exactly the same text that is in the — as a matter of the text, the relative relationship, the arrows, the flow, the thickness of the lines, the type, to the best of my understanding, — you know, we copied it exactly as it was in the Sundstrand document.

Q: You mentioned a jury notebook, I think the jurors can see that, but also for the record, it's part of PTX 63, and that's one of the documents I showed you earlier. And the relevant excerpt from PTX 63 is in the jury notebook, that's the demonstrative?

A: It says here 963.

Q: That's the number of that particular board for demonstrative purposes, but the document it comes from PTX 63 in the jury notebooks.

Now, using that, I think you have said overall or an overall view. Start to explain the logic that the APS 3200 uses in controlling surge.

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A: Well, what it does is the way that Sundstrand — I'm sorry.

The way that Sundstrand has chosen to really illustrate this is to break some of the functions down into various descriptions. And starting here, it's what is called, what they called the BCV closed loop PI surge control.

Q: There is this acronym in there, BCV, what does that mean?

A: I have to apologize for the engineering profession because what we use is acronyms all over the place and you've heard a lot of jargon.

Actually it does follow a certain logic, that BCVCTL means bleed control valve control. BLDSEL is bleed select. Bleed select. IGVPOS, IGV position.

T2 is a two — T is temperature. Two is the location, which is right at the

[19] location, right where the air goes into the [20] compressor and the gas turbine that has a location [21] two. That's referred to as T2.

[22] PS, in the way that Sundstrand [23] chooses to call it, refers to the location of the [24] pressure at the discharge of the compressor.

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[1] P2, again, is the pressure right at [2] the inlet of the compressor, that pressure at [3] location two. Temperature location two.

[4] PS, again, is the same here as it is [5] here. And DELP is — that's an acronym for delta [6] P which refers to the change in pressure.

[7] And what Sundstrand does is within [8] the compressor itself, between the discharge of [9] the compressor and the diffuser, and I didn't show [10] you, because it's very hard to visualize, but it's [11] a small segment, just as it leaves the rotating [12] impeller where thermodynamically all the [13] pressure — there is pressure increase.

[14] And as much as I'm going to discuss [15] it, because it's not germane to what is occurring [16] here, basically, it's a part of the compressor, [17] and it's a location where Sundstrand measures [18] pressure.

[19] So this delta P is the change in [20] pressure between the diffuser, a position in the [21] diffuser and a position at the discharge of the [22] compressor.

[23] And what they do is that based on [24] this change in pressure — now, remember what was

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[1] mentioned earlier, I don't recall where, just [2] where it was mentioned, but this value delta P [3] over PS, that is delta P over P, that during [4] long — long before in the early development of [5] this engine, for this compressor under test [6] conditions, they just — they went out and [7] actually in a test stand, you measure the flow and [8] then you measure delta P over P on this part of [9] the graph, and on this part you measure flow. [10] What.

[11] You do is as you increase flow, you [12] measure this characteristic using other [13] instruments, laboratory instruments. This is a [14] test cell, and with that you're able to calibrate [15] how this particular compressor works.

[16] So they got a correlation that is [17] something that for delta P over P and for certain [18] flow varies — values changed as inlet guide vane [19] was taken from the minimum to the maximum [20] position.

[21] So here this is where they actually [22] generate flow. A flow measurement, here, which is [23] also called a flow perimeter, but it's basically a [24] flow measurement, a means of measuring flow.

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[1] This here, the temperature is used [2] in order to make corrections in how the — it [3] makes corrections in how this curve I mentioned is [4] used, because there is, you know, you operate [5] these aircrafts at all sorts of temperatures.

[6] You have a standard temperature, [7] very cold day, hot day, desert conditions and you [8] have to make some corrections. That's why you [9] measure the temperature at the inlet.

[10] This is used to actually come out [11] with a value called bleed control valve control, [12] that's shown as a voltage, V. So there is a [13] voltage coming out, and it goes into another [14] component.

[15] By the way, if you were to look [16] at — this is all on a computer, and you were to [17] look at it, you would never see any of this stuff [18] because they're all integrated. This is only for [19] illustrative purposes, so you can logically follow [20] it.

[21] This is for the engineers to [22] logically follow it. So what's being shown to you [23] here is just what engineers use themselves. It [24] hasn't been provided for your purpose alone.

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[1] So a value is established and that [2] goes into a sequencing, what they call a BCV [3] limited and sequencing logic. It's basically [4] where some of this information is collected, but [5] other things are happening, too.

[6] Because of the way that Sundstrand [7] has chosen to measure flow, they end up with a [8] curve which has kind of a funny characteristic to [9] it. And that characteristic is such that they [10] have to measure what the inlet guide vane position [11] is in order to control the surge control system, [12] so that they can determine when it's what they [13] term something like high flow and low flow.

[14] Now we're getting into kind of how [15] this actually works.

[16] But as far as the overall idea here, [17] what's going on, they're measuring flow here, [18] they're correcting it for local temperature, [19] they're measuring the IGV position, and they're [20] using it in the determination of what signal [21] actually goes to the bleed control valve, which is [22] that one valve that moves back and forth.

[23] And, basically, the signal goes to [24] this valve here as it rotates, as it swings back

Page 630

[1] and forth. And that's what this whole effort here [2] has done. And so that's, basically, the function [3] I believe.

[4] **Q:** All right. Mr. Muller, let me actually [5] ask you to keep this up for a secor

[6] **A:** Okay.

[7] **Q:** And introduce two other graphics we're [8] going to see a little bit later.

[9] I see the top one here says Figure [10] 12A and BCV closed loop PI surge control.

[11] Does the Sundstrand documents [12] contain a detail or a blowup of what happens in [13] that part of the control logic?

[14] **A:** Yes, it does.

[15] **Q:** I don't know that I want to go through [16] all the detail now, but can you use the poster [17] board that you prepared just to show the jury [18] what's going on in that part?

[19] **A:** Okay. Well, we can start on 12A. Start [20] on 12A.

[21] **Q:** And why don't you — first of all, if you [22] could keep it on the ground — go ahead. That [23] works better.

[24] Let's go through the detail when we

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[1] get to the patent claims. But just in a general [2] manner, what is this that the jury is looking at?

[3] **A:** What you're looking at, what yo[u] re [4] looking at is a much more detailed schematic now [5] of the various functions. And now we're getting [6] into acronyms which it doesn't — which I'm not [7] going to go into because what I would prefer to do [8] is, rather than deal with the acronym, tell you [9] what it does.

[10] Would this be an appropriate time to [11] discuss proportion and integral control?

[12] **Q:** Let me, first of all, have the [13] foundation. Is this, again, a document that comes [14] from the Sundstrand business records you were [15] looking at earlier?

[16] **A:** Yes.

[17] **Q:** The color coding, is that yours or [18] Sundstrand?

[19] **A:** It's mine.

[20] **Q:** The text, this text here that goes with [21] the color coding, I take it [illegible] your text, [22] also?

[23] **A:** Yes. Yes.

[24] **Q:** But the rest of the diagram is from the

Page 6[illegible]

[1] Sundstrand document is that what you're saying?

[2] **A:** All of this, from here, everything that [3] you see written here, from here, is

based on a — is based on a Sundstrand document which is figure 12a in this [illegible] thick ECB document. That's what [illegible] taken from.

[illegible] Let me ask you, maybe I'll lay a chart over here in a minute, if you can relate this one figure we have just gotten up to the overall figure that you have there.

A: Okay. This is — here, this is what is called BCV closed loop PI surge control. This figure 12a, which is all of this.

And the DLPPS and T2 that are indicated here refer to these things, exact same thing. So, basically, you can see why, you know, this is just a, just a blot showing what's really inside here.

Q: How about the variable BCV TCL that's shown on the overall chart coming out, is that shown on this chart?

A: Yes. That's this green — this light green, BCV TL is the same as this light green shown here.

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You can see the reason why to the color coding, because it's easier to follow.

[illegible] Let me ask you about Figure 12b, [illegible] also have a chart prepared for Figure 12b?

A: Yes, I do.

Q: Let's do the same thing. First of all, I'll show the jury 12b, and then I'll ask you, again, to relate it to the overall logic diagram.

A: Here it's 12 — 12b shows where measurements are made of pressure at the discharge, pressure at the — pressure at the inlet of the compressor, IGV position, temperature T2, again, measured at the inlet of the compressor, and IGV position, which you actually have an electrical device on top of the IGV.

And as it rotates, it gives you a signal in proportion to the amount that's opened. That's why it's shown in percentage.

Q: And am I right, again, that the colors that are on the chart you have added?

A: Yes, I have.

Q: But other than the coding for the colors at the top, the source of the chart is?

[illegible] The source of the chart comes [illegible]

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Sundstrand's ECB document.

Q: And again, let me play chart holder.

A: But I haven't finished with this yet. I just want to indicate that there is, also you see a term here DELPQP, this is not a measured value, this is a calculated value. So it's shown separately.

It will be discussed shortly. What the output is, which is shown in red here, which is BLDSEL, which is bleed select. And basically, the selection is to tell the surge control system if it's operating at the high end of the flow or if it's operating at the low end of the flow where surge is possible.

The logic being that when you're at the high end of the flow chart, there is no possibility for surge. But when you're at the low end, there is possibility for surge and the surge control system has to work hard to avoid it.

Q: Okay. Can I be the chart holder now?

A: Please.

Q: Okay. Let me hold this up.

I apologize for blocking the court staff momentarily. Can you, again, relate this

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diagram to the overall diagram?

A: Yes. This diagram here refers to this item here, which is shown as Figure 12b.

Q: And can you match up to inputs and the outputs like you did last time?

A: Yes. Here are the measured values, P2, PS2, actually position. They are the same as here. It's repeated twice here because how it's shown, and BLD select is this value here, which is shown as zero one. And that feeds into the logical sequence here.

Q: Mr. Muller, I want to turn now to the Honeywell patents, the '194 and '893 patents that are the subject of this lawsuit.

A: Excuse me, do you want me to return to the witness stand?

Q: Actually I think with the Court's permission, I want you to stay there because you can refer to these diagrams that we just introduced to the jury.

Let me ask you the question, have you formed an expert opinion as to whether the Sundstrand surge control system that's illustrated there infringes the claims of the Honeywell '194

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and '893 patent?

A: Yes, I have.

Q: Okay. I'm going to take you through those claims one at a time, and let me start, if I can, and ask Mr. Schlaifer if he please can put up Claim 4 of the '194 patent.

And let me say while we're waiting, that the text, you have seen these before, a lot of text, small display — actually it's not bad, but I think you'll see we're going to be able to blowup pieces, so hopefully, as we go through them, it will be easier.

Mr. Muller, have you formed an expert opinion on whether Sundstrand APS 3200 infringes Claim 4 of the Honeywell '194 patent?

A: Yes, I have.

Q: And what is that opinion?

A: My opinion is that it does.

Q: And in your opinion, is that infringement literal or under the Doctrine of Equivalents?

A: Based on my understanding of what a literal infringement is, I believe it's literal infringement.

Q: Do you have an opinion if, whether there

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was a finding that there was no literal infringement, that there would still be infringement under the Doctrine of Equivalents claim?

A: I believe it's literal infringement, but implicit in that, if it's not literal, then it's so close, that it's, basically, equivalent.

Q: Now, on the left-hand side here we have the text of the patent claim, and on the right-hand side there, you have a column that says present in Sundstrand's APS 3200.

And in this one, there are three places where it says Sundstrand admits yes. What does that denote?

A: Well, my understanding is that in prior documents that Sundstrand has submitted in exchanges between Honeywell and Sundstrand, that they have admitted that these particular elements of the claim have been agreed to. That is, Sundstrand has agreed that they, in fact, infringe on these particular elements of Claim 4.

Q: Okay. Now, I'm going to ask you to go through this word by word, element by element because as Judge Sleet told the jury in the

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beginning, and as Mr. Ziegler indicated and Mr. Krupka indicated, we need to address every element of the claims and determine whether it's in the APS 3200.

So let me start with the first introductory part to Claim 4, and ask Mr. Schlaifer to actually blow that up so I can see it a little bit larger.

[9] "A method of utilizing a compressor [10] of a gas turbine engine to power pneumatically [11] operated apparatus having a variable inlet air [12] flow demand, the compressor having adjustable [13] inlet guide vanes, said method comprising the [14] steps of:"

[15] In your opinion, is that part of [16] Claim 4 of the '194 patent met by the APS 3200?

[17] **A:** Yes, it is.

[18] **Q:** Can you briefly explain why?

[19] **A:** Well, just going through the sentence, a [20] method of utilizing a compressor of a gas turbine [21] engine. And this is the compressor of the gas [22] turbine engine.

[23] To power pneumatically operated [24] apparatus, powering pneumatically operated

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[1] apparatus, refers to pressurized air to the [2] aircraft, which goes through an environmental [3] control system with a pneumatically operated [4] apparatus, having a variable inlet air flow [5] demand.

[6] We have guide vanes which vary the [7] inlet air flow demand. It's the BCV that has — I [8] got ahead of myself. This is not easy to read.

[9] I've been reading these for months. [10] The pneumatically operated apparatus having a [11] variable inlet air flow, this concerns the [12] environmental air control on the aircraft, [13] adjustable inlet guide vanes.

[14] These are the inlet guide vanes that [15] are on the APS 3200, and the method comprising of [16] the next item.

[17] **Q:** Let's go to the next steps. The first [18] step of the method of Claim 4 reads, [19] "Interconnecting a supply duct between the [20] compressor and the pneumatically operated [21] apparatus."

[22] I note that's one of the ones where [23] we have Sundstrand admits, yes, but let me go [24] ahead and ask you for the record, in your opinion,

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[1] does the APS 3200 system meet that limitation?

[2] **A:** Yes, it does.

[3] **Q:** Can you show the jury where?

[4] **A:** Basically, as shown, from the compressor [5] itself, there is a duct which connects through the [6] bleed control valve to another duct which [7] eventually goes to the aircraft, to pneumatically [8] operated apparatus.

[9] **Q:** The next step of Claim 4 of the '194 [10] patent reads, "flowing discharge air from the [11] compressor through said supply duct to the [12] pneumatically operated at apparatus."

[13] Again, I note that's one where [14] Sundstrand admits yes. Let me ask you, is that [15] present in the APS 3200?

[16] **A:** Yes. The prior one referred to the [17] actual duct.

[18] This is now referring to what is in [19] the duct, which is the air going through the [20] duct. So it's the same logic as before.

[21] It goes from the compressor and the [22] pressurized air goes to the pneumatically operated [23] apparatus on the aircraft.

[24] **Q:** Clause C of Claim 4 is a mouthful, so I

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[1] want to take it in little steps. The first clause [2] of the claim, Clause C, Claim 4 reads maintaining [3] an essentially constant minimum supply duct flow [4] rate, despite fluctuations in the flow rate of air [5] received by the pneumatically operated [6] apparatus."

[7] I'm going to ask you, sir, piece by [8] piece, and then I'll ask you the overall thing. [9] That's the way to deal with such a long claim [10] term.

[11] Does the APS 3200 meet that part of [12] Claim 4?

[13] **A:** Yes.

[14] **Q:** Can you explain to the jury why that is?

[15] **A:** Well, as I described to you earlier, when [16] it says maintaining an essentially constant [17] minimum supply duct flow rate, this is the duct [18] that we're talking about. And what is supplying [19] the flow rate is the load compressor.

[20] And that flow stays, stays at a [21] constant minimum, not simply at a minimum, but it [22] stays at a constant minimum, despite the changes [23] in the position of the bleed control valve, which, [24] as you recall, I mentioned that when it diverts

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[1] flow between these two, by the way, equal sized [2] pipes, the diameter of this pipe, this duct is the [3] same as the diameter of this, the same as the [4] diameter of this duct, so it can take the full [5] capacity of the flow coming out of the compressor.

[6] And what that says is that — so [7] this enables it then, that even if I move this [8] valve completely over for all the air to go to the [9] aircraft, the flow here will stay constant. If I [10] take at the same time and move that valve [11] physically over to the exhaust, the flow will go [12] to the exhaust, but the flow will remain [13] constant.

[14] The compressor does not really know [15] how much air is going here or here as the valve is [16] being activated.

[17] **Q:** The next part of Step C of Claim 4 of the [18] '194 patent reads, "by exhausting air from said [19] supply duct response to variations therein in [20] the value of a predetermined, flow-related [21] parameter."

[22] Is that met or present in the APS [23] 3200?

[24] **A:** Yes.

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[1] **Q:** Explain why, please.

[2] **A:** Well, two parts. Again, the air going to [3] the supply duct, but now the question is what is [4] controlling that, and that goes back to what I had [5] shown earlier.

[6] And what the point is here — the [7] issue here is the exhaust air from the apply duct [8] I just described. Now, the other part of it is [9] the predetermined flow-related parameter.

[10] And this is the pre-determined flow [11] related parameter. Where you take the change in [12] pressure, divide it by the pressure, and that is [13] compared to a value on a curve.

[14] And that's the predetermined portion [15] is the curve. So you go to the value, you go to [16] the curve and pick off a value. That's what's [17] referred there.

[18] **Q:** Why is that a flow-related parameter?

[19] **A:** Well, because as the — in that guide [20] vane change position on the load compressor, the [21] flow changes on the load compressor, and that [22] results in a change in pressure.

[23] For as the flow is changing, the — [24] there is a change in pressure inside the

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[1] compressor, and also there is a change in the [2] pressure at the discharge of the compressor.

[3] So when you divide this value by [4] that value, you always get a different value [5] depending on what the flow is.

[6] **Q:** Okay. The next part of Claim 4C reads, [7] "The flow rate of air exhausted from said supply [8] duct being related to the magnitude of said [9] parameter value variations in both a proportional [10] and time-integral manner."

[11] Is that part met by the APS 3200?

[12] **A:** Yes, it is.

[13] **Q:** Can you show where, please?

[14] **A:** Now, we're getting into describi the [15] proportional and time integ manner. I'll get [16] into that in a moment.

[17] But to get that, we start off as we [18] said earlier, you've got your flow rate and you [19] generate a signal, which is called

DELPQP. I only mention it because it comes up again and again.

But you generate a signal, and eventually before I get into discussing how this happens, but this is really referring to when it goes into this part of the circuitry.

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Now what it's doing here — perhaps I should describe this.

What it's doing here is it measures flow, it measures flow. And then it compares it. It compares it against a desired value, a desired value where the flow should be at that particular — at that particular location.

It's like the examples you heard about temperature variation. You have a set point at a certain value, this is your set point here. And where you want to be is here, and so what you get is a difference.

So sort of where I am and where I would like to be.

Now, in controlled terminology, that's referred to as an error. It's just the way it's done, it's called an error. It's their world.

So in controlled thinking, it's referred to as an error. And then this is a signal.

But before you can do anything with the signal, you have to do a couple more things with it. You just can't take that difference and

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push it out into the valve and try to turn the valve around.

You have to do something because it's not a usable signal yet. You have to do something.

You have to pass it through what is called the controllers, and there are two ideas here. And that is called a proportional controller and an integral control.

And physically, I feel that one way of understanding what a proportional controller is is this idea: If you're driving home, and you're trying to get home, home is your desired value, that's where I want to go.

Now, if I'm five miles away and I'm in a rush, I have something to do at home. I'm five miles away, I'm going to apply greater load, make a greater effort to get there.

The proportional controller does hat. It says, Gee, if I'm far away, I'm going co drive harder to get there faster because I want to get there.

If that error, if that distance, if you happen to be three blocks away from home,

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still have the same desire and value, still want to be there, you're not trying as hard, it's not as much effort because it's only a few blocks away.

Now, having said that what the proportional controller will do is when you drive by your house, you're not going to stop at your house. If your proportional controller is controlling your car at that point, it's going to go up to your house and go right past it.

And then it's going to go down the block and say, Woops, I missed the house, and it's going to come back and drive back up the road again. And this time it may also miss it, but not go quite as far beyond the driveway.

It will do this for a while. This is what proportional controllers could.

So to help the proportional controller work properly what it has is what is called an integral controller. And what it says is, basically, that the proportional controller gets you close to your house and then the integral controller says, I know where the driveway is, and it makes the car turn in the driveway and go to

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your desired point.

So what this does here is generate information, electrical information, taking the result of these flow measurements, it takes the result of this comparison that's made here, takes that information, and then processes it along the lines I've just described it, and then, finally, comes out with an electrical signal, a signal which then can be used by the bleed control valve in order to get to the position it should be.

Not just going back and forth and getting close and running back and forth, but getting to where it should be. And that's the way it's done.

Q: Okay. And then —

A: But I have to cover that proportional integral at some time.

Q: And based on that explanation, does that match up with the portion of Claim 4 that was most recently read into the record?

A: Yes, it does.

Q: The next part of Claim 4 reads, " said maintaining step including the steps of providing an outlet passage from said supply duct."

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Is that present in the APS 3200?

A: Yes. Yes.

It's providing — the passage that's referred to here is an outlet passage, including the steps of providing an outlet passage from said supply duct.

Yes. These are the various passages from the supply duct.

Q: Okay. The next step, next part of Step C of Claim 4 is, "positioning in said outlet passage a surge bleed valve operable to selectively vary the flow of air outwardly through said outlet passage."

Is that met in the APS 3200?

A: Yes, it is. And it's met in what we have been discussing now for a while, where the flow comes out, it goes through the valve, and it goes out here.

I believe it's referring to outwardly, or its goes to the aircraft.

Q: The next part of Element C of Claim 4 of the '194 patent says, " generating an integral control signal in response to said variation in said flow-related parameter, generating a

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proportional signal in response to said variations in said flow-related parameter."

Is that met in the APS 3200?

A: Yes, it is.

Q: Can you show the jury where that is?

A: This goes back to what I was saying earlier, but what they're specifically breaking out is we're taking this information here, but we're only talking about passing it through this portion, this dark blue portion, which is the proportional portion of the analysis.

Q: The next part of the claim — we may have skipped —

A: I believe there should be something about integral controls. Did we move ahead?

Q: Maybe we can go back to all of Claim C. What I want to do is I'll point to it.

A: Generating, yes.

Q: Generating the integral — the next part of Claim C of Claim 4 of the '194 patent was generating an integral control signal in response to said variation in said flow-related parameter. It actually came in the claim before the proportional signal.

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You explained the proportional signal. Is the part that I just read relating to the integral signal present in the APS 3200?

A: Yes, it is.

Q: Can you show the jury where?

A: It's — as I discussed earlier, this was

[7] a proportional portion in dark blue, the green [8] portion in parallel, simultaneously, this [9] integral, this integral portion which is where you [10] are generating an integral signal in response to [11] the flow-related parameter.

[12] **Q:** And the final, I think, part of Clause C, [13] we finally got to the end, is " simultaneously [14] utilizing said integral and proportional control [15] signals to operate said surge bleed valve."

[16] Is that present in the APS 3200?

[17] **A:** Yes, it is.

[18] **Q:** Can you show the jury where that is [19] present?

[20] **A:** Well, it gets, the proportional signal [21] and the integral signal get combined here and then [22] generates actually a control signal for the bleed [23] control valve.

[24] **Q:** I think we've now made it all the way

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[1] through Claim C and — or Clause C of Claim 4. [2] And to summarize, in your opinion, does the APS [3] 3200 surge control system meet all of the [4] different elements of Step C of Claim 4 of the [5] '194 patent?

[6] **A:** Yes, it does.

[7] **Q:** Now, let me turn to the final part of [8] Claim 4, which is Clause D.

[9] Clause D says, "adjusting the [10] relationship between the magnitude of said [11] integral and proportional control signals and the [12] magnitude of said parameter variations as a [13] function of the position of the inlet guide [14] vanes."

[15] Is that part of Claim 4 of the '194 [16] patent present in the APS 3200?

[17] **A:** Yes, it is.

[18] **Q:** Explain where, please.

[19] **A:** Well, this is the portion here, as I [20] indicated earlier, the IGV position. The IGV [21] position is used in the determination of where [22] the — of where the compressor is operating on the [23] flow curve that I referred to if it's operating in [24] the high flow region or in the low flow region.

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[1] When it's operating in the low flow [2] region, which means close to the area where surge [3] can occur, the proportional and integral — the [4] proportional and integral control portions are [5] functioning and the adjustment occurs when — I [6] should — I had forgotten to mention something to [7] you.

[8] It's very important because it ties [9] into what we're talking about here. I want to [10] take a small step back.

[11] **Q:** Okay.

[12] **A:** One thing I forgot to mention is it [13] refers to — what I forgot to mention was update [14] rate of ten milliseconds here, and the values [15] range between — I think in this particular case, [16] it's 10 to 40 milliseconds, which means what is [17] happening here is this calculation that I've shown [18] here, this instruction that goes out to the [19] control valve, it's not really continuous.

[20] It's not opening and closing a valve [21] on a water faucet. You open a bit and increase [22] and decrease it. It's not the way it works.

[23] Computers don't work that way. What [24] they do is they have to scan information. And

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[1] what they do, it's like polling — bad word these [2] days — but still, they have to scan around and [3] they actually, the computer will go and measure [4] pressure and temperature, then IGV position, and [5] it goes around and it makes all the calculations, [6] determines what the value should be, and then it [7] starts over again.

[8] And it does this continuously. In [9] fact, it does it from the moment the surge control [10] system or really when the engine is turned on, [11] when it's electrically turned on, it starts to do [12] it already.

[13] So it's doing it between 25, 25 [14] and — 25 and a hundred times a second, 25 and a [15] hundred times a second. It's making this [16] calculation continuously, and it does it all the [17] time.

[18] It never stops doing it. While the [19] engine is on, the electrical system is on, it does [20] it on a continual basis.

[21] Now, having said that, what it's [22] doing when it gets to a high flow condition, when [23] it gets to a high flow condition, this computation [24] continues, continues, but since there is no chance

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[1] for surge flow to occur, it doesn't bother to use [2] this information any longer, and says all we need [3] is a fixed value now, because it's a high flow.

[4] There is no chance for error, so we [5] generate — so we generate a fixed signal of some [6] kind that keeps the valve fully opened going to [7] the aircraft. That's, basically, what it does.

[8] **Q:** Okay. And can you explain —

[9] **MR. ZIEGLER:** Your Honor, can I [10] just ask Mr. Putnam to record on the record where [11] the witness was moving his hand when he said, when [12] it gets to high flow conditions in this [13] computation?

[14] **THE WITNESS:** I believe it was [15] the — what I was referring to, Mr. Ziegler, is [16] that the come —

[17] **BY MR. PUTNAM:**

[18] **Q:** Let me respond to Mr. Ziegl issue, [19] which I'm happy to do, and then — because I think [20] his issue was for me, not for the witness, which [21] was for the record, when Mr. Muller made the [22] statement that Mr. Ziegler referred to, he was [23] referring to the blue or the purple and dark green [24] portions of what we have marked as Plaintiffs'

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[1] Exhibit 954.

[2] Now, let me ask you, Mr. Muller, to [3] tie that language in Claim 4d. Show the jury, [4] please, how adjusting the relationship between the [5] magnitude of said integral and proportional [6] control signals and the magnitude of said [7] parameter variations as a function of the position [8] of the inlet guide vanes.

[9] **A:** Basically what it says there is for [10] varying flow, as I interpret it for varying flow, [11] the determination of where the proportional [12] integral controllers will impact is a function of [13] the IGV position, which will determine — which [14] will determine the actual — the actual [15] relationship of the proportional and integral [16] controller as it relates to the flow parameter, [17] whi is measured — which is another way [18] saying, a very long-winded way of saying it [19] determines — it basically — basically, adjusts [20] these values to accommodate for the fact that [21] there is a variation — that there is a part of [22] the flow control where it — there is no chance [23] for surge — part of the flow curve where there is [24] no chance for surge, and the lower part of the

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[1] flow curve, where there is the possibility of a [2] surge, referred to as high and low flow.

[3] **Q:** Is that a function of the position of the [4] inlet guide vanes?

[5] **A:** Yes, it is.

[6] **Q:** Where in the testimony is that shown?

[7] **A:** That's shown right here.

[8] **Q:** And for the record, you have up what [9] we've marked for identification as PTX 955, is [10] that right?

[11] **A:** Yes, it is.

[12] And your question, sir?

[13] **Q:** Where on PTX Exhibit 955 is the position [14] of the inlet guide va function in?

[15] **A:** This is shown here as the input, as the [16] input in determining in the overall function [17] and — it's used as part of the logic which [18] determines —

which determines when the — where [19] we are on this curve, high or low flow.

Okay. Let me now ask Mr. Schlaifer [1] to put up all of Claim 4, and ask you now that we've [22] walked through each and every step, each and every [23] word of Claim 4 of Honeywell's '194 patent, is it [24] your opinion that Sundstrand's APS 3200 surge

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[1] control system literally infringes that patent?

[2] **A:** I believe so.

[3] **Q:** Now, let me turn to the Honeywell '893 [4] patent. And I think the pace will pick up a [5] little because a lot of the concepts will be [6] familiar.

[7] Let me ask Mr. Schlaifer to first [8] put up Claim 8 of the '893 patent.

[9] Okay. Again, we'll blow up the [10] language of the claims so that it's easier for the [11] jury to see as we go through it.

[12] I see here paragraphs where [13] Sundstrand admits yes, I also see paragraphs where [14] it says Sundstrand's expert admits yes. What's [15] that about?

[16] **A:** My understanding is that Sundstrand's [17] expert, in depositions that [18] participated in, [18] expressed a view [18], in effect, admitted that [19] the — that particular section here, Claim [20] 8c, and Claim 8e, in fact, Sundstrand did infringe [21] on them per the expert's statements.

[22] **Q:** Okay. And when you refer to the [23] Sundstrand expert statement, you're referring to [24] Mr. Shinskey, is that right?

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[1] **A:** Yes.

[2] **Q:** Let me just, for the record, identify [3] Plaintiffs' Exhibit 873. I'm not going to ask you [4] any substantive questions other than: Is what's [5] in the chart that you recall in connection with [6] the admission that you just referred to?

[7] **A:** Yes, it is.

[8] **Q:** And was it your recollection — you were [9] at Mr. Shinskey's deposition; is that right?

[10] **A:** Yes, I was.

[11] **Q:** And was it your recollection that [12] Mr. Shinskey indicated that the parts of the [13] claims that were in bold type in this Exhibit 873 [14] were the ones he was contesting, and the parts of [15] the claim that were in standard type were the ones [16] he conceded were present in the [17] APS 3200?

[17] **A:** That was my recollection, yes.

[18] **Q:** Okay. Let's walk through Claim 8, and as [19] I said, I think we'll be able to do it a little [20] bit more quickly, given that we have some similar [21] concepts. But we've got to do it step by step.

[22] Let me start with the top of Claim [23] 8, the first part of Claim 8 of the '893 patent. [24] I suppose I should ask you the overall question,

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[1] first.

[2] Do you have an opinion as to whether [3] the APS 3200 surge control system infringes [4] Claim 8 of Honeywell's '893 patent?

[5] **A:** Yes, I do.

[6] **Q:** What is that opinion?

[7] **A:** I believe that in that particular — in [8] that particular — are you asking me of the [9] element or Claim 8?

[10] **Q:** Claim 8, yes.

[11] **A:** As far as the claim, I believe it's [12] equivalent — on the basis of equivalents, it does [13] infringe on — that Element 8 — that Sundstrand [14] infringes on Element 8, yes.

[15] **Q:** I got you tangled up there. Let me start [16] the question over again.

[17] **A:** Yes.

[18] **Q:** What is your opinion with regard to [19] Claim 8 of Honeywell's '893 patent and the [20] Sundstrand APS 3200?

[21] **A:** Well, my opinion is that Sundstrand, in [22] fact, infringes on Claim 8.

[23] **Q:** Is that infringement literal or under the [24] Doctrine of Equivalents?

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[1] **A:** On certain aspects, the literal basis, [2] and certain elements, it's based on equivalents.

[3] **Q:** Okay. With that background, let me now [4] walk us through each part of Claim 8.

[5] The top of Claim 8 reads, "a gas [6] turbine engine accessory power unit having a [7] fluctuating compressed air supply demand, said [8] accessory power unit comprising."

[9] That's one I note Sundstrand admits [10] yes to. Does the APS 3200 meet that part of [11] Claim 8, in your opinion?

[12] **A:** Yes, it does. And as indicated earlier, [13] this is the gas turbine portion. And the [14] compressed air supply, after having a fluctuating [15] compressed air supply depending on what the [16] aircraft is demanding.

[17] **Q:** The next part of Claim 8 which Sundstrand [18] also admits is "a compressor having adjustable [19] inlet guide vanes."

[20] Does the APS 3200 meet that part of [21] the claim?

[22] **A:** Yes, it does. They're shown here.

[23] **Q:** And for the record you have Honeywell PTX [24] 952 in front of the jury; is that correct?

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[1] **A:** That is correct.

[2] **Q:** The next part of Claim 8 reads, " duct [3] means for receiving compressed air discharged from [4] said compressor and supplying the received air to [5] the pneumatically-powered apparatus."

[6] Again, that's one that Sundstrand [7] admits. Can you show where on PTX 952 that is [8] indicated?

[9] **A:** Yes. This is the duct portion that that [10] refers to.

[11] **Q:** Okay. The next part of Claim 8 of the [12] '893 patent, Part C reads, "surge bleed means [13] operable to exhaust from said duct means a [14] selectively variable quantity of air to assure at [15] least a predetermined minimum flow rate through [16] said duct means and thereby prevent surge of said [17] compressor."

[18] Is that present in the APS 3200?

[19] **A:** Yes, it is.

[20] **Q:** Can you show where?

[21] **A:** It refers to the bleed control valve [22] which can divert flow back and forth between the [23] aircraft and the exhaust.

[24] **Q:** The next part of Claim 8 of Honeywell's

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[1] '893 patent reads, "sensing means or sensing the [2] value of a predetermined, flow-related parameter [3] within said duct means and generating an output [4] signal indicative of said value, said value of [5] said flow-related parameter being substantially [6] independent of the temperature of the compressed [7] air."

[8] Is that met in the Sundstrand [9] APS 3200?

[10] **A:** Yes, it is.

[11] **Q:** Can you explain why, please?

[12] **A:** At the — in the duct itself, if you [13] recall, I mentioned that they measure a pressure [14] at the discharge of the compressor itself, that is [15] measured in the duct portion of the compressor at [16] the discharge where the output — the discharge is [17] part of the duct of the compressor.

[18] And let's see. What more does it [19] say?

[20] Sensing means is the actual pressure [21] sensor, where there is a hole in the duct. So [22] there's a pressure device screwed into it, and [23] it's also in communication with whatever the air [24] is in the duct. And that's the sensing means, I

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[1] believe, that that's referred to.